



The CMMI[®] Product Suite and International Standards

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Report Documentation Page				Form Approved OMB No. 0704-0188	
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1. REPORT DATE JUL 2006		2. REPORT TYPE		3. DATES COVERED 00-00-2006 to 00-00-2006	
4. TITLE AND SUBTITLE The CMMI Product Suite and International Standards				5a. CONTRACT NUMBER	
				5b. GRANT NUMBER	
				5c. PROGRAM ELEMENT NUMBER	
6. AUTHOR(S)				5d. PROJECT NUMBER	
				5e. TASK NUMBER	
				5f. WORK UNIT NUMBER	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Carnegie Mellon University ,Software Engineering Institute (SEI),Pittsburgh,PA,15213				8. PERFORMING ORGANIZATION REPORT NUMBER	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)				10. SPONSOR/MONITOR'S ACRONYM(S)	
				11. SPONSOR/MONITOR'S REPORT NUMBER(S)	
12. DISTRIBUTION/AVAILABILITY STATEMENT Approved for public release; distribution unlimited					
13. SUPPLEMENTARY NOTES					
14. ABSTRACT					
15. SUBJECT TERMS					
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT Same as Report (SAR)	18. NUMBER OF PAGES 34	19a. NAME OF RESPONSIBLE PERSON
a. REPORT unclassified	b. ABSTRACT unclassified	c. THIS PAGE unclassified			



Agenda

Evolution of Capability Maturity Models® and ISO/IEC 15504

ISO/IEC 15504 Overview and Status

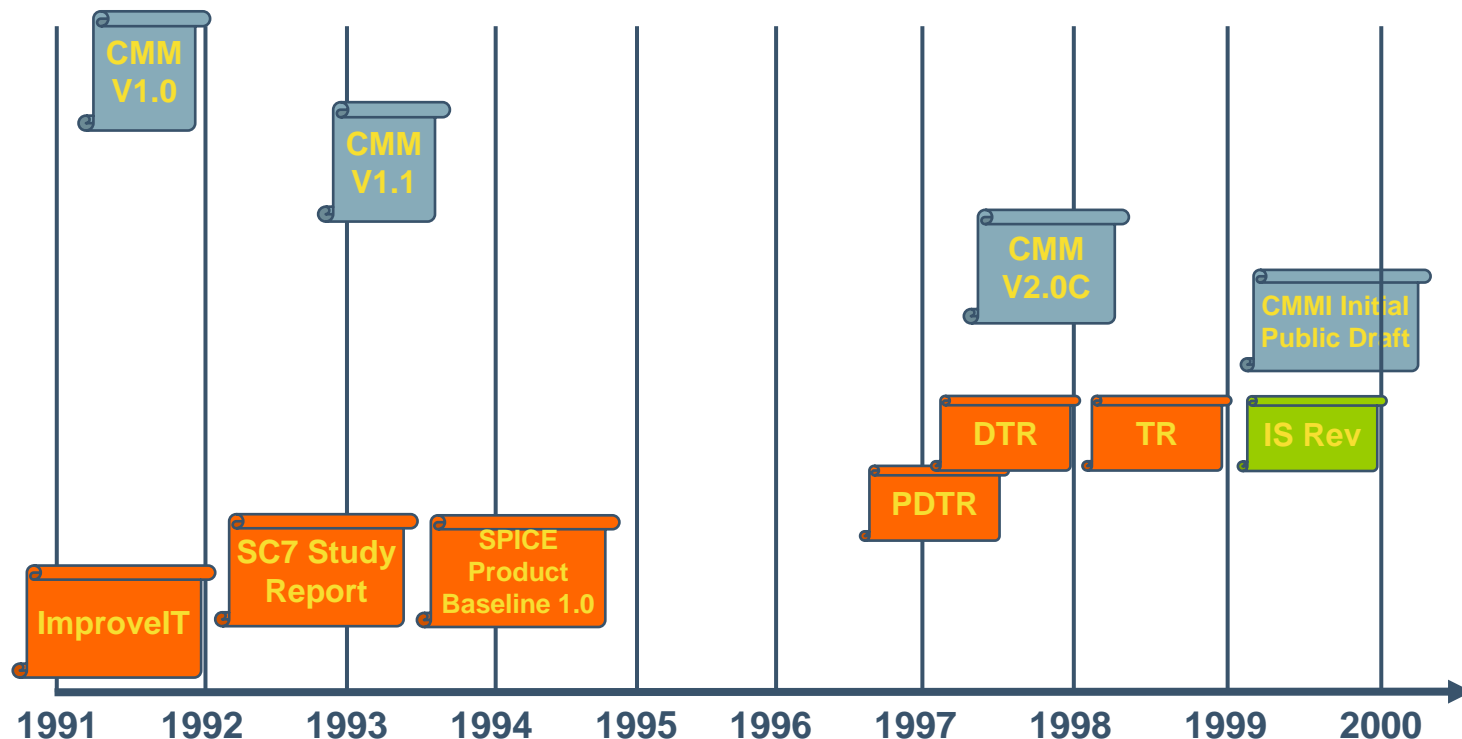
CMMI Synergy with International Standards

Work to be Done

Future Directions

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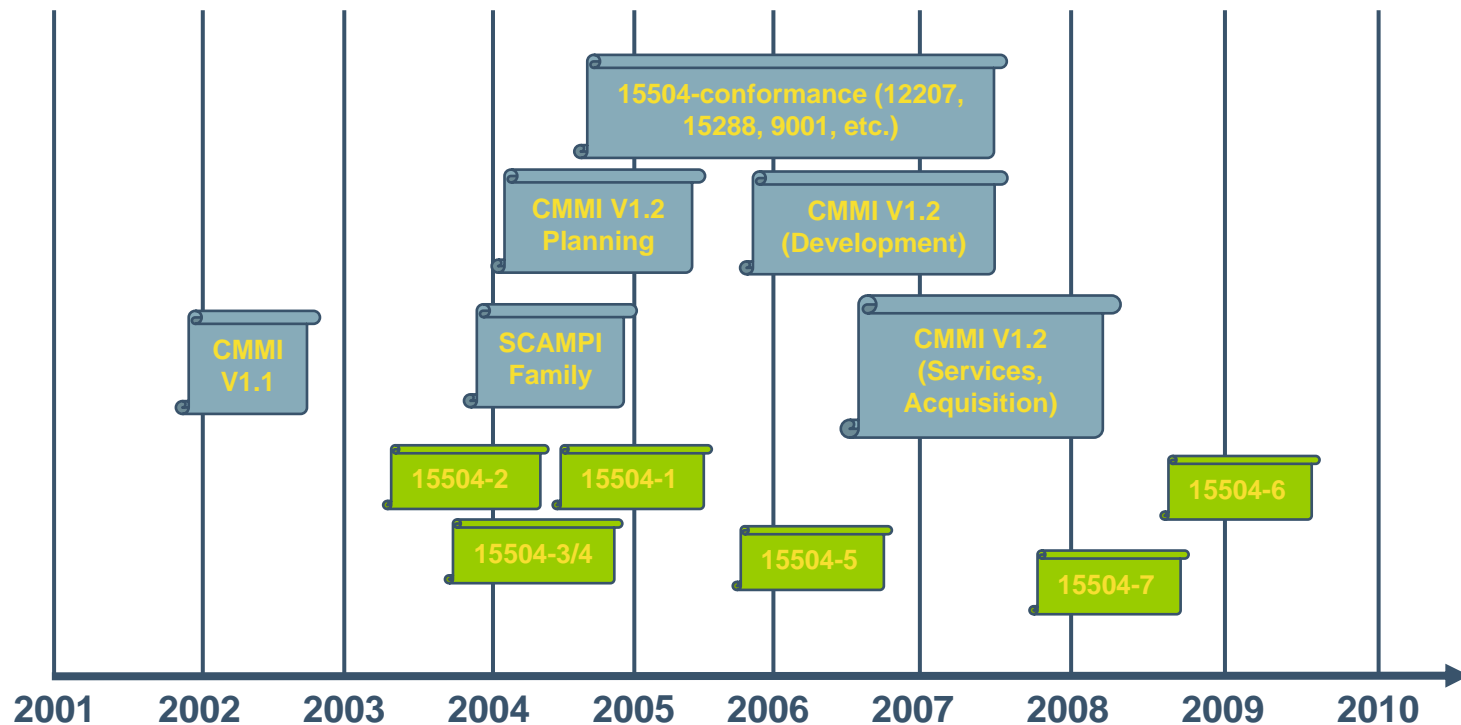
Progression of CMMs® and 15504 -1



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Progression of CMMs and 15504 -2





What EXACTLY is 15504?

ISO/IEC 15504 is an international standard being progressed by WG10 - a working group established by ISO/IEC/JTC1 SC7.

Prescribes requirements for process assessment; is a framework standard.

Consists of 5 documents (15504-1, ..., 15504-5); note that all parts are now published.

Not the same as ISO/IEC TR 15504 – this is a 9-part set of documents published as ISO Technical Reports in 1998.



Key Premise Underlying 15504

Assessments of process capability will yield results which are comparable as long as:

- **the process assessment model satisfies 15504 model compatibility requirements**
- **the assessment process satisfies 15504 assessment requirements**
- **the assessment contexts are similar**



Evolution of 15504 Specificity

1st generation (pre-Pilanesburg) - practices were HARD-WIRED into 15504 (as a normative component - BPG)

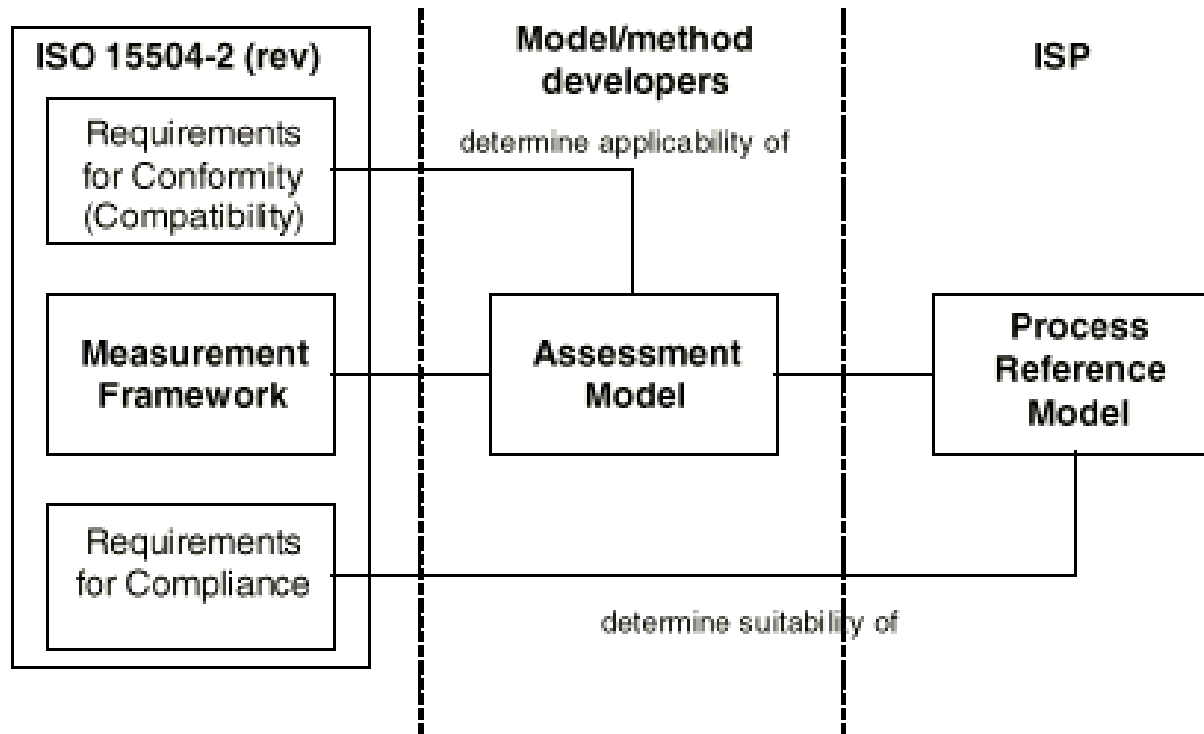
2nd generation (pre-IS) - process definitions were HARD-WIRED into 15504 (as a normative component - 15504-2)

3rd generation (IS) - compliance requirements for Process Reference Models (PRMs) HARD-WIRED into 15504 (as a normative component - 15504-2):

- **PRMs will be externally specified**
- **12207 includes as an amendment a PRM encompassing TR 15504-2 process definitions (and more)**



Architecture for 15504





CMMI and 15504

A-spec requirements relevant to international standards:

“2.3 Reference Documents

**2.3.1 Applicable ISO/IEC documents, including
ISO/IEC 12207 and ISO/IEC 15504.”**

“3.1 Development User Requirements

**3.1.6 The CMMI Product Suite shall be consistent
and compatible with ISO/IEC 15504.”**



Synergy With Selected International Standards -1

Identify areas where there are opportunities for synergy between key international standards and the CMMI Product Suite

Exploit these opportunities by developing appropriate work products and/or liaising with appropriate individuals and organizations



Synergy With Selected International Standards -2

Two of the key areas identified to date are the ISO 9000:2000 family of standards and the ISO/IEC 15504 standard

Note that 15504 provides a mechanism for establishing important relationships to other important process-related international standards such as ISO 9001:2000, 12207, 15288



Key Supplements Needed

Identification of suitable process reference models,

**Mappings between CMMI model (s) and PRM (s)
satisfying 15504 -2 requirements,**

Translation mechanism



Translation Mechanism

Purpose: for representing the results of an assessment as a set of process attribute ratings for each process selected from the specified Process Reference Model

How?:

1. direct translation of Process Assessment Model ratings into a process profile
2. or the conversion of the data collected during the assessment (with the possible inclusion of additional information) through further judgment on the part of the assessor.

Status

A detailed mapping has been developed from CMMI to:

- **the Measurement Framework in ISO/IEC 15504; and**
- **the Process Reference Model included in ISO/IEC 12207.**

A possible approach has been developed for verifiable conversion of results.



An Approach for Data Conversion - 1

For the Process Dimension:

- **Collect data and generate observations for all Specific Practices in Process Areas within the scope of the assessment.**
- **Using the mapping tables, assign the data observations to all Process Outcomes and Attributes indicated from the mapping.**
 - **Thus, if a Specific Practice maps to multiple Process Outcomes, assign the data to all of the possibilities.**
- **Review the assigned data and remove observations that are not relevant.**
- **Judge whether the remaining data is adequate to enable judgement of achievement of the outcomes.**



An Approach for Data Conversion - 2

Where adequate data is available, consolidate the data to the process level and rate the performance of the process (Process Attribute 1.1).

If the data is not adequate, either:

- Collect additional data; or
- Remove the process from the 15504 scope of the appraisal.



An Approach for Data Conversion - 3

Repeat the exercise for the Generic Practices and Process Attributes 2.1 – 5.2.

Additional data will need to be collected to address gaps in the mapping

- **Most notably in Process Attribute 3.2**

In some cases, evidence from Advanced Practices may also be relevant to a particular Process Attribute for a specific Process or set of Processes.



Tool Support

To achieve this form of conversion is complex and difficult, without tool support.

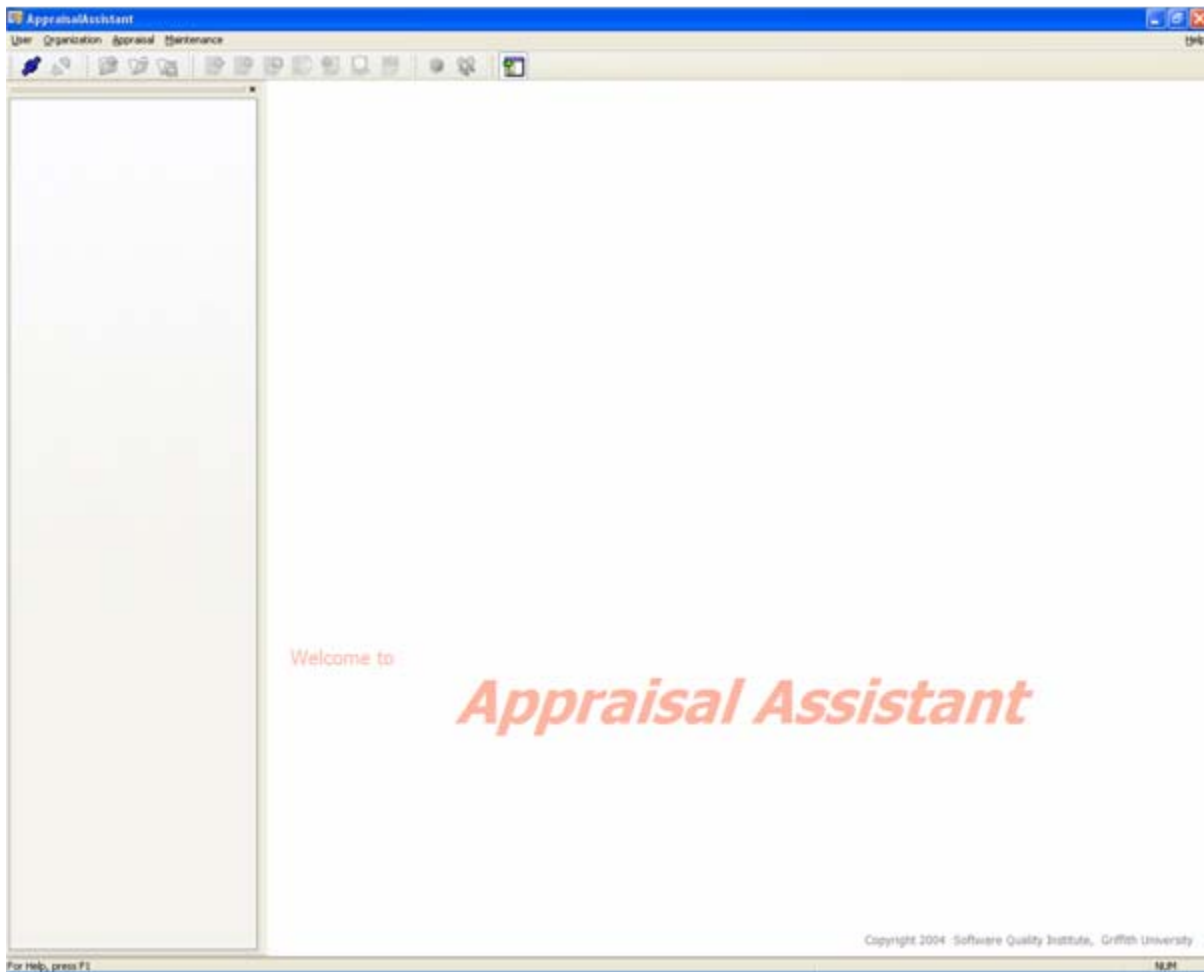
A tool (the Appraisal Assistant) has been developed for managing evidence and ratings in CMMI appraisals, with a specific focus on conversion of data to generate ISO15504 Process Profiles.

The tool automatically generates lists of data for a Process Attribute based upon detailed ratings tables.

- It permits de-selection of data judged to be not relevant.
- It highlights areas where there may be a lack of relevant evidence.



The Appraisal Assistant





Model Details

Standard Appraisal Model Editor

Process Specific Dimension | Generic Dimension

Process Specific Dimension

- [OT] Organizational Training
- [OPF] Organizational Process Focus
- [OPD] Organizational Process Definition
- [OPP] Organizational Process Performance
- [OID] Organizational Innovation and Improvement
- [PP] Project Planning
 - SG 1 Establish Estimates
 - SP1.1-1 Estimate the Scope**
 - Task descriptions
 - Work package descriptions
 - Work breakdown structure
 - Top-level WBS revision
 - SP 1.2-1 Establish Estimates
 - SP 1.3-1 Define Project Life Cycle
 - SP 1.4-1 Determine Estimate
 - SG 2 Develop a Project Plan
 - SG 3 Obtain Commitment to the Project
- [PMC] Project Monitoring and Control
- [SAM] Supplier Agreement Management
- [IPM] Integrated Project Management
- [RSKM] Risk Management
- [IT] Integrated Teaming
- [QPM] Quantitative Project Management
- [REQM] Requirements Management
- [RD] Requirements Development
- [TS] Technical Solution
- [PI] Product Integration
- [PSM] Integrated Supplier Management

Generic Dimension

Name: Estimate the Scope of the Project

Acronym: SP1.1-1 Capability: Level 1

Group: Maturity: P.I.I. Type:

C. Feature: P.I.I. Type:

☒ Practice Included in Stage Representation

Appraisal Consideration

- Determination of WBS usage for this practice must be based on top-level WBS only, not its fully elaborated and expanded form as referenced in subsequent practices of this PA

- Top-level work breakdown structure should be driven by and linked to specified product requirements. (See Requirements Management PA)

Summary

Establish a top-level work breakdown structure (WBS) to estimate the scope of the project

Related ISO-12207 Process Outcomes/ISO-15504-2 Attribute Achievements

F.3.1.3/1 The scope of the work for the project is defined (Process specific)

F.3.6/4 The reuse potential of each domain is assessed (Process specific)

F.3.6/5 Reuse proposals are evaluated to ensure the reuse product is suitable

Framework Selection

☒ CMMI ☐ ISO12207/15504-5

Add Process Area

Add Goal

Add Practice

Add P.I.I.

Delete Subtree

Max. Capability Level

5

Delete All Mapping

Import Mapping Table

Add Mapping

Delete Mapping

Close



Pilot Appraisal

**15504-conformant SCAMPI A appraisal conducted at
Critical Software, SA during February-March 2006**

- **Maturity level 3 scope**
- **Process reference model embedded in ISO/IEC 12207 (amended)**
- **Mapping between CMMI and 12207 provided by Software Quality Institute**
- **Appraisal team included 3 SCAMPI Lead appraisers , one ISO 9001 auditor and one SPICE assessor**
- **Support automation provided by Software Quality Institute – Appraisal Assistant**
- **Subset of 15504 process profiles generated as well as selected ISO 9001 outcomes.**



Project Management Process

Maps to elements from the following Process Areas:

- **Project Planning**
- **Project Monitoring and Control**
- **Supplier Agreement Management**
- **Requirements Management**
- **Integrated Project Management**
- **Quantitative Project Management**

With minor linkages to

- **Organizational Process Performance**
- **Risk Management**
- **Verification**



Project Management Process

ISO15504 Process Profiler

Process Name: F.3.1.3 Project management
The purpose of the Project management process is to identify, establish, co-ordinate, and monitor the activities, tasks, and resources necessary for a project to produce a product and/or service, in the context of the project's requirements and constraints.

Process Attribute: PA3.1 Process Performance attribute
Process Attribute Achievement: Fully Achieved

Strength: Weakness:

Outcome: (1) The scope of the work for the project is defined.

Address Evidence

Evidence	Instantiation	CMM Practice	Characteristic	Evidence Description
Analysis Phase Overview Presentation	GSFP2	PP-SG 1-SP1-2-1	Strength	Presentation - analysis overview
Architecture (deliverable)	SGA1	PP-SG 1-SP1-2-1	Strength	
Audit Report	WCHBES	REQM-SG 1-SP1-5-1	Strength	
CSH-2004-REL (S60-external-misc-technical.doc)	SMCE	PP-SG 2-SP2-4-1	Strength	
csu-spl-open-project-form.doc	OFF	PP-SG 2-SP2-4-1	Strength	
CSH-QM-2003-PCS-2206-project-pla-cycleu.pdf	WCHBES	PP-SG 1-SP1-3-1	Strength	
CSH-SGA1-2003-QAP-2002-qa-plan.doc	SGA1	PP-SG 1-SP1-3-1	Strength	
CSH-SMCE-2004-QPL-2013-external-misc-detailed-plan.mpp	SMCE	PP-SG 2-SP2-4-1	Strength	
Detailed Plan Analysis phase	GSFP2	PP-SG 2-SP2-4-1	Strength	
Detailed Plan Modeling Phase	GSFP2	PP-SG 2-SP2-4-1	Strength	
Enterprise architecture file (with used with Request - from Spandystems - for requirements change management)	WCHBES	REQM-SG 1-SP1-5-1	Strength	
Exceptions and non-compliance	GSFP2	REQM-SG 1-SP1-5-1	Strength	
External Meeting minutes with consortium	GSFP2	REQM-SG 1-SP1-5-1	Strength	
FAK Support Category	WCHBES	PP-SG 2-SP2-1-1	Strength	
Financial maps	SGA1	PP-SG 2-SP2-1-1	Strength	
Financial Proposal	SGA1	PP-SG 2-SP2-1-1	Strength	
http://www.critical.pt/cmm/management/project-management/CSH-QM-2003-PCS-L779-project-management.pdf	GSFP2	PP-SG 2-SP2-4-1	Strength	
Interview QAP Team	OFF	REQM-SG 1-SP1-5-1	Strength	
Interview PM	GSFP2	PP-SG 1-SP1-3-1	Strength	
Interview SMCE team	SMCE	PP-SG 1-SP1-3-1	Strength	
Management proposal	SGA1	PP-SG 1-SP1-3-1	Strength	
Master Plan	GSFP2	PP-SG 2-SP2-4-1	Strength	
Meeting minutes (Technical)	OFF	REQM-SG 1-SP1-5-1	Strength	
Modeling Overview Presentation	GSFP2	PP-SG 1-SP1-2-1	Strength	
open-project-external-misc.doc	SMCE	PP-SG 2-SP2-4-1	Strength	
QAP Team Interview	OFF	PP-SG 1-SP1-5-1	Strength	
Project Life Cycle Management Process	GSFP2	PP-SG 1-SP1-3-1	Strength	
Project Progress Reports	SGA1	REQM-SG 1-SP1-5-1	Strength	
Proposal: part5:technical:proposal	GSFP2	PP-SG 1-SP1-3-1	Strength	
Prototype presentation to the customer	SMCE	REQM-SG 1-SP1-5-1	Strength	
Requirements doubts meeting	SMCE	REQM-SG 1-SP1-5-1	Strength	
RID Form	GSFP2	REQM-SG 1-SP1-5-1	Strength	
SGA1 - Master Plan.mpp	SGA1	PP-SG 2-SP2-1-1	Strength	
Statement of work	GSFP2	PP-SG 1-SP1-3-1	Strength	
System requirements review report	SMCE	REQM-SG 1-SP1-5-1	Strength	
technical proposal	SGA1	PP-SG 1-SP1-2-1	Strength	
User requirements review report	SMCE	REQM-SG 1-SP1-5-1	Strength	
Workshop with customer for presenting requirements for analysis	WCHBES	REQM-SG 1-SP1-5-1	Strength	
WCHBES PM Interview	WCHBES	PP-SG 1-SP1-3-1	Strength	

Reset Evidence Delete Unchecked

Reset Profile Report Close



PA 2.1 – Process Management

ISO15504 Process Profile

Process Name: Acquisition preparation
The purpose of the Acquisition preparation process is to establish the needs and goals of the acquisition and to communicate these with the potential suppliers.

PA1.1 PA2.1 PA2.2 PA3.1 PA3.2 PA4.1 PA4.2 PA5.1 PA5.2 Process Summary ISO 15504 Profile Summary

Process Attribute: PA2.1 Performance management attribute

Process Attribute Achievement: Fully Achieved

Strength: Weakness:

Achievement: all objectives for the performance of the process are identified

Related Evidence

Evidence	Instantiation	OWE Practice	Characteristics
<input checked="" type="checkbox"/> Detailed project plan	ORGANIS...	TS-GG 2-GP 2.2	Strength
<input checked="" type="checkbox"/> Engineering board meeting minutes	ORGANIS...	TS-GG 2-GP 2.2	Strength
<input checked="" type="checkbox"/> F&B Process Management Category	ORGANIS...	SAM-GG 2-GP 3.1	Strength
<input checked="" type="checkbox"/> Master Plan	GSFP2	TS-GG 2-GP 2.2	Strength
<input checked="" type="checkbox"/> PMIC Interview PM SPICE	SHICE	TS-GG 2-GP 2.2	Strength
<input checked="" type="checkbox"/> Project Plan	SSGAI	TS-GG 2-GP 2.2	Strength
<input checked="" type="checkbox"/> Quality Council meeting minutes	ORGANIS...	TS-GG 2-GP 2.2	Strength
<input checked="" type="checkbox"/> Quality Manual	ORGANIS...	TS-GG 2-GP 3.1	Strength
<input checked="" type="checkbox"/> Quality Policies	ORGANIS...	SAM-GG 2-GP 3.1	Weakness
<input checked="" type="checkbox"/> SW Construction Process	ORGANIS...	TS-GG 2-GP 2.2	Strength
<input checked="" type="checkbox"/> SW Design Process	ORGANIS...	TS-GG 2-GP 2.2	Strength

Reset Evidence Delete Unchecked

Achievement: all performance of the process is planned and monitored

Related Evidence

Evidence	Instantiation	OWE Practice	Characteristics
<input checked="" type="checkbox"/> Audit Report	WOWERS	SAM-GG 2-GP 2.9	Strength
<input checked="" type="checkbox"/> Audit Report - 2006	OFF	SAM-GG 2-GP 2.9	Strength
<input checked="" type="checkbox"/> Audit Report Jan 06	GSFP2	SAM-GG 2-GP 2.9	Strength
<input checked="" type="checkbox"/> CSW-SIA3-2005-QAP-2002-qa-plan.doc	SSGAI	SAM-GG 2-GP 2.9	Strength
<input checked="" type="checkbox"/> Detailed project plan	SHICE	TS-GG 2-GP 2.2	Strength
<input checked="" type="checkbox"/> Document Review Records	SHICE	TS-GG 2-GP 2.8	Strength
<input checked="" type="checkbox"/> Interview PM GSFP2	GSFP2	SAM-GG 2-GP 2.9	Strength
<input checked="" type="checkbox"/> Interview PM SSGAI	SSGAI	SAM-GG 2-GP 2.9	Strength
<input checked="" type="checkbox"/> Master Plan	GSFP2	TS-GG 2-GP 2.2	Strength
<input checked="" type="checkbox"/> Meeting minutes (Technical)	OFF	TS-GG 2-GP 2.8	Strength
<input checked="" type="checkbox"/> Milestone SQA report	SSGAI	TS-GG 2-GP 2.8	Strength
<input checked="" type="checkbox"/> PDR milestone report	WOWERS	TS-GG 2-GP 2.8	Strength
<input checked="" type="checkbox"/> PDR product assurance report	SHICE	TS-GG 2-GP 2.8	Strength
<input checked="" type="checkbox"/> PMIC Interview PM SPICE	SHICE	TS-GG 2-GP 2.2	Strength
<input checked="" type="checkbox"/> Project Detailed Plan	SSGAI	TS-GG 2-GP 2.2	Strength
<input checked="" type="checkbox"/> Project SQA Plan	SHICE	SAM-GG 2-GP 2.9	Strength
<input checked="" type="checkbox"/> Review records	OFF	TS-GG 2-GP 2.8	Strength
<input checked="" type="checkbox"/> SW Construction Process	ORGANIS...	TS-GG 2-GP 2.2	Strength
<input checked="" type="checkbox"/> SW Design Process	ORGANIS...	TS-GG 2-GP 2.2	Strength

Reset Evidence Delete Unchecked

Report on audit of the project conducted as planned.

Reset Profile Report Close

PA 2.2 – Work Product Management

[illegible]



PA 3.1 – Process Definition

ISO15504 Process Profiler

Process Name: Acquisition preparation

PA1.1 | PA2.1 | PA2.2 | **PA3.1** | PA3.2 | PA4.1 | PA4.2 | PA5.1 | PA5.2 | Process Summary | ISO 15504 Profile Summary

Process Attribute: PA3.1 Process definition attribute

Process Attribute Achievement: Not Rated

Strength: Weakness:

PA3.1.1 Acquisition preparation

The purpose of the Acquisition preparation process is to establish the needs and goals of the acquisition and to communicate these with the potential suppliers.

PA3.1.1.1 Supplier selection

PA3.1.1.2 Supplier monitoring

PA3.1.1.3 Supplier acceptance

PA3.1.1.4 Supplier tendering

PA3.1.1.5 Product release

PA3.1.1.6 Requirements elicitation

PA3.1.1.7 System testing

PA3.1.1.8 Software installation

PA3.1.1.9 System requirements...

PA3.1.1.10 System architectural...

PA3.1.1.11 Software requirements...

PA3.1.1.12 Software design

PA3.1.1.13 Software construction

PA3.1.1.14 Software integration

PA3.1.1.15 Software testing

PA3.1.1.16 System integration

PA3.1.1.17 Software and system...

PA3.1.1.18 Documentation

PA3.1.1.19 Change request man...

PA3.1.1.20 Configuration manage...

PA3.1.1.21 Quality assurance

PA3.1.1.22 Verification

PA3.1.1.23 Validation

PA3.1.1.24 Joint review

PA3.1.1.25 Audit

PA3.1.1.26 Problem resolution m...

PA3.1.1.27 Organizational align...

PA3.1.1.28 Project management

PA3.1.1.29 Quality management

PA3.1.1.30 Risk management

PA3.1.1.31 Measurement

PA3.1.1.32 Infrastructure

PA3.1.1.33 Process establishment

PA3.1.1.34 Process assessment

PA3.1.1.35 Process improvement

PA3.1.1.36 Human Resource Pro...

PA3.1.1.37 Human resource man...

PA3.1.1.38 Training

PA3.1.1.39 Knowledge management...

PA3.1.1.40 Asset management

PA3.1.1.41 Reuse program mana...

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PA 3.2 – Process Deployment

ISO15004 Process Profiler

Process Name: Acquisition preparation

Process Purpose: The purpose of the Acquisition preparation process is to establish the needs and goals of the acquisition and to communicate these with the potential suppliers.

PA3.1 | PA2.1 | PA2.2 | PA3.2 | PA4.1 | PA4.2 | PA5.1 | PA5.2 | Process Summary | ISO 15004 Profile Summary

Process Attribute: PA3.2 Process deployment attribute

Process Attribute Achievement: Not Rated

Strength: [] Weakness: []

Achievement: (A) A defined process is developed based upon an appropriately selected and/or tailored standard process.

Related Evidence

Evidence	Initiation	CMMI Practice	Characteristic	Evidence Description
MM-Process Management Categories	Organizational...	TS-60 3-SP3.1	Strength	The QMS provides support for most functions in projects within Critical.
Follow-up Interviews	WVIVERS	TS-60 3-SP3.1	Strength	
Interview PM-Off	OMF	TS-60 3-SP3.1	Strength	
KOH inputs	SMICE	TS-60 3-SP3.1	Strength	
KOH Presentation	SMICE	TS-60 3-SP3.1	Strength	
Project Life Cycles	Organizational...	TS-60 3-SP3.1	Strength	
Project Management Process	Organizational...	TS-60 3-SP3.1	Strength	
Project Master Plan	SMICE	TS-60 3-SP3.1	Strength	
Project Plan	SSIAI	TS-60 3-SP3.1	Strength	
Project Plan (PMP)	OMF	TS-60 3-SP3.1	Strength	
Project Proposal	GSIP2	TS-60 3-SP3.1	Strength	
Project SQA Plan	OMF	TS-60 3-SP3.1	Strength	
Project Technical and Management proposal	SMICE	TS-60 3-SP3.1	Strength	
Proposal	WVIVERS	TS-60 3-SP3.1	Strength	
QA Plan Template	Organizational...	TS-60 3-SP3.1	Strength	
Quality Assurance Plan	GSIP2	TS-60 3-SP3.1	Strength	

Reset Evidence Delete Unchecked

Achievement: (B) Required roles, responsibilities and authorities for performing the defined process are assigned and communicated.

Related Evidence

Evidence	Initiation	CMMI Practice	Characteristic	Evidence Description

Reset Evidence Delete Unchecked

Achievement: (C) Personnel performing the defined process are competent on the basis of appropriate education, training, and experience.

Related Evidence

Evidence	Initiation	CMMI Practice	Characteristic	Evidence Description

Reset Evidence Delete Unchecked

Achievement: (D) Required resources and information necessary for performing the defined process are made available, allocated and used.

Related Evidence

Evidence	Initiation	CMMI Practice	Characteristic	Evidence Description

Reset Profile Report Close



Pilot Appraisal Report

Result considered a successful demonstration of ability to fulfill 15504 requirements and generate 15504 process profile relative to a separate process reference model,

Demonstrated criticality of adequate supporting automation



Pilot Observations

Improvement opportunities were identified for support automation

Sample of 12207 processes were rated and a sample of 9001 clauses were examined

Observed consistency between CMMI findings and prior 9001 audit reports as well as prior SPICE assessments, given the expected progress of the improvement program at Critical.



Issues from the Pilot Appraisal

Model-related:

- Deficiencies previously identified in the relationship between CMMI Generic Practices and the 15504 Measurement Framework had a significant impact on assessment of Level 3 Process Attributes.

Technology-related:

- Significant issues in usability of the “translation” functions.
- Need to incorporate the ability to capture additional evidence where needed.



Further effort

Additional pilot appraisals are required to identify any additional issues and to raise confidence in the translation mechanism as well as the translation requirements of 15504.

Ideally a combined CMMI / SPICE assessment using two independent teams should be undertaken.

The ability to perform “bi-directional” translation would be useful (i.e. determine CMMI capabilities from a SPICE assessment) would be useful.

Beta-2 Release

Significant improvements to the Evidence Registry and to Ratings Generation.

CMMI – ISO 15504 mapping functions improved in line with findings from the Pilot Appraisal.

Available for download from
<http://www.sqi.gu.edu.au/AppraisalAssistant>

The SQI is committed to two further beta releases of the Appraisal Assistant in 2007.



Beta Test Programme

Initial release 2005

Beta 2 release 28 July 2006

503 registered beta testers

217 downloads of Beta 2 version



More Information

The Appraisal Assistant:

- <http://www.sqi.gu.edu.au/AppraisalAssistant>

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